Subject: History of the Optical Program.

To: The Historical Division. S.G.O.

Thru: The Chief, Supply Service

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The history of the Optical Program begins in May 1940 and relates all the important events up to 31 December 1945. The true facts are related, and in criticizing certain aspects of the program, no reflections are cast upon the administrative abilities of any person connected with this program. It is intended to describe the over-all program and pointing out where mistakes were made in order that our predecessors may have something concrete with which to work in the event a program of this magnitude is again needed. The history is concluded with certain recommendations which are not only the ideas and impressions of the author, but also, of persons who were directly connected with this program and since have been separated from the Service. The recommendations are the consensus of individuals who are responsible for the administration of this program as well as of those who handled the various mechanics of fabricating spectacles.

To begin with, it must be stated and emphasized and re-emphasized that the Optical Program, although considered relatively minor and unimportant, was in reality very significant as concerns the health of the Army. In most instances, the program as a whole ran along smoothly, and consequently, attention was not invited to the importance of this program. The difficulties which were experienced were ordinarily localized, and therefore, not sufficient to attract attention. During a critical point of this program, Lt. Col. Walter H. Potter took over the responsibilities STORICAL DISISION 3.0.9.

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and established this program to such an extent that the administration was more or less automatic, and difficulties were quickly dealt with.

The importance of this program can be visualized more exactly when it is understood that over 18% of all military personnel required spectacles for the correction of their visual acuity. The importance is further emphasized when an excerpt from Lt. Col. James N. Greear, Jr.'s report of the "Ophthalmological Activities in the European Theater of Operations During the First Half of 1945", is studied. Therein, he makes a statement that were it not for the optical facilities which operated in that Theater, it would be necessary to evacuate approximately 10,000 soldiers per month who have lost or broken their spectacles. In reality, the efficiency of an individual is only as good as his eyesight—be he a Service Forces or combat soldier. During the last few years, the commercial optical companies have been making the public eyesight conscious, and undoubtedly, the Optical Program will be realized as more important as time goes by.

Before the history of the Optical Program is related, it is felt that due credit should be given to the two optical companies which undoubtedly carried the burden of the load in supplying military personnel with spectacles. They are the American Optical Company, Southbridge, Mass., and the Bausch & Lomb Optical Company, Rochester, New York. These two companies, despite the unusual demand for their production from civilians, were at all times conscious of the importance of the Army's Optical Program and never failed to be fully cooperative. It can be stated without fear of contradiction that were it not for these two companies the Army's Optical Program would be a serious failure. At this time, it should also

be mentioned that due credit should also be given to Mr. Jerry Curry and Mr. H. E. Weber of the American Optical Company, and Mr. Jack Gwillim and Mr. W. H. Whelpley of the Bausch & Lomb Optical Company, who had worked at all times in close cooperation with the Army and who devoted their time in teaching optics to the individuals responsible for administering the Army's Optical Program. These men were at all times cognizant of the importance of this program and devoted their time above and beyond that normally required in connection with their responsibilities to aid and further the Optical Program. It is the opinion of the author that the aforementioned companies and men should be given some official recognition for the splendid work they have done.

On May 12, 1941, the Commanding Officer of the Station Hospital at Ft. McClellan, Alabama, advised The Surgeon General that approximately seventy-five enlisted men of the 27th Division had broken their spectacles in the performance of military duty and the majority of these men could not have their spectacles repaired or replaced inasmuch as they were lacking funds. He further stated that a number of enlisted men, since being inducted in the federal service, were refracted at the Station Hospital at Ft. McClellan, and spectacles were strongly recommended, but a great many of the individuals were financially unable to purchase the necessary glasses, thus rendering themselves less efficient in the performance of their duties.

At that time, the only provisions for purchasing spectacles for military personnel at government expense were contained in AR 40-1705 which authorized the procurement of spectacles at public expense only when it

was necessary for the correction of visual defects resulting from violence suffered in the performance of duty.

However, as early as May 1940, a consideration was given to providing spectacles for military personnel during the national emergency, and at one time, it was contemplated that the American Red Cross would make such distribution in view of the existing Army Regulation. The Red Cross did not feel inclined that the matter of providing spectacles for military personnel was their responsibility and the matter was dropped.

Upon receipt of the letter from Ft. McClellan, the question was vigorously pursued. It was estimated at that time that approximately 10% of military personnel required spectacles and that the minority of these would not be wearing glasses at their entrance into the Service; therefore, making it necessary in some instances to provide the initial pair of eye-glasses. These estimations were based upon figures available from World War I, and it was felt that conditions since World War I in respect to an increase in deficient eyesight had not materially increased to affect the statistical data available.

At this point, it may be stated that the first mistake was made in computing requirements at 10% of all military personnel requiring spectacles. Normally, it would have been correct to assume that conditions since World War I in deficient eyesight had not increased to any material extent; however, we neglected to remember that the education of the public with relation to eyesight had not begun until about 1930, and therefore, during World War I and in the 1920's, visual deficiency had not increased, but the public was not aware that their eyesight had depreciated considerably and that the normal cure was a pair of glasses. It is safe to assume that

although in this war it was found that 18% of the individuals required visual correction, this figure may increase in perhaps twenty years to approximately 25% when the public as a whole will become more eye conscious.

The study concerning the issuance and repair of spectacles was made, and the entire matter reported to The Adjutant General on 5 June 1941 (S.G.C. File 413.75-2), with the recommendation that eyeglasses be supplied to military personnel. It was explained that approximately 10% of the selected trainees required glasses. In presenting advantages of providing spectacles to military personnel, it was pointed out that "correction of refractive defects insured maximum efficiency in the performance of military duty". The Adjutant General approved this recommendation and directed The Surgeon General to provide spectacles and the repair and replacement thereof, and to make such incidental arrangements and such contracts as may be necessary. He further directed that The Surgeon General publish such directives and information as were required.

Shortly after the receipt of the authority of The Adjutant General, letters were written to each service command stating the tentative plan of The Surgeon General, i.e., to let contracts for the issuance of spectacles, one in each service command. Although several of the surgeons of the service commands were receptive to this idea, it was felt that due to the fact that a standard frame would be adopted, difficulties would result if nine separate contracts were placed with individual dealers in the various localities. As will be later pointed out, the increase in requirements would not have made feasible a plan of placing contracts in each service command and the program would have collapsed.

The first problem was to select a frame which had military characteristics; i.e., would be most suitable for military personnel.

Originally, two types of frames were considered; namely, the zylonite flesh colored frame with padded temples and wire core, and white metal nickel silver frame with comfort cable temples. After some consideration and consultation with manufacturers, it was decided the white metal frame would serve all purposes and be most satisfactory. It appeared that the zylonite frame would easily be broken when used in extremely cold temperatures or could easily go out of adjustment in extremely warm climates. As stated, the frame selected was composed of 10% nickel silver and had a reinforced bridge which could not be placed out of shape with ordinary vigorous usage. Later on, as the program was under way, it was found in extremely warm climates the frame corroded easily at such points which came into contact with the skin, in some instances causing discoloration and dermatitis. Consequently, the nickel silver content of the frame was raised to 18%, and some of the parts such as pad arm and pad arm assembly and endpieces, cable windings, were made of pure nickel. In extremely few cases, it was also necessary to furnish zylonite frames to individuals who had an idiosyncrasy of the skin whereby contact with metal caused dermatitis. Such requirements, however, were extremely small, and no special provisions had to be made for providing these frames. Attached hereto is a specification of the frame which was finally adopted. It may be stated that at the termination of the War. individuals who served with optical repair units in the warm climates insisted that the ideal type of frame would be one of zylonite construction. It should be pointed out, however, that although there is no such argument that such frame is ideal for warm climates, such individuals advocating this frame are not aware of the reactions of this frame in cold climates.

At one point in the program, numerous complaints were received from the various posts, camps and stations procuring spectacles issued by the government that the frames caused discoloration of the skin.

However, an extensive survey was made of each military installation, and it was found that in the majority of instances the discoloration was caused through an idiosyncrasy of the skin rather than from a defect in the construction of the metal frame.

As mentioned above, although the theory was disapproved that nickel silver frames caused discoloration and dermatitis, it is believed that this resulted from the fact that individuals in the field handling this inquiry were not sympathetic with the survey and because they lacked optical experience. With the war being terminated and an opportunity now being at hand to sift the various opinions on this subject, it is the firm conclusion of the author that the ideal type of frame is one which is gold filled. In addition, it is believed that the frame should either be flesh colored (in pink or white gold, and if at all possible, some form of camouflage such as etching should be used in order to minimize the reflection received from a highly polished frame).

At this point, it is felt that it would be well to mention the fact that frame production is extremely important. It may be emphasized that a great deal of difficulty was experienced when requirements were recomputed from 200,000 pairs of spectacles per year to 2,350,000 pairs inasmuch as a production cycle of five months was involved, i.e., from the time that allocations were received for raw materials to the time a finished product was distributed and stocked at the branches. Consequently,

it was necessary that any sudden increase in requirements be predicated at not less than 180 days. When requirements were re-computed and found to be completely erroneous in that the new requirement was approximately 1200% in excess of the old, it was realized that the sole contractor for commercial type spectacles would be unable to meet the total demand either from the standpoint of production as well as filling prescriptions on an individual basis. The War Production Board was requested to survey the entire optical industry, and as a result of these findings, the production of the spectacle frames was apportioned among nine frame manufacturers. and the prescription contract was given to two optical companies which had dispensing facilities in all parts of the country. Frame production was allocated on the basis of all the frame manufacturers' civilian production in order that all optical companies could equally share in the Army's requirement and at the same time not penalize one manufacturer by forcing him to devote his full production to Army requirements while other manufacturers continued selling spectacle frames to commercial sources at a higher margin of profit.

Lenses which were chosen for use with the spectacle frames in commercial type spectacles were of first quality free from any defects, strias, chips, etc., and were actually the best quality lens available in wholesale production. (The American Optical Company Centex and Bausch & Lomb Optical Company Balcor or equivalents were provided.) Bifocal lenses were also supplied and these were of the Kryptok variety which was a first quality lens as far as civilian consumption was concerned. Although issuance of spectacles was confined to these two types of lenses, there were instances where, in unusual circumstances, special types of lenses such as corrected

curve, special base curves, flat lenses, lenticular lenses, contact lenses, etc., were supplied. However, these were not specifically set forth in the contract, and before purchase of such lenses was made, it was necessary to receive prior authority from The Surgeon General. Early in 1945, this authority was decentralized to the Service Commands and Ports of Embarkation. All such purchases of special lenses were made under the existing spectacle contracts, and in that way, lenses were received at the wholesale price, and the various administrative and fiscal problems were made uniform.

As in the case of frames, the increase in requirements both on a prescription basis in this country as well as an overseas stockpile set up to supply the mobile, base and portable optical repair units in the various theaters of operations, it was necessary that the lens production be apportioned among eleven lens manufacturers. This again was handled through the War Production Board, and the requirements were allocated for the same reason as applied to the frames mentioned above.

The difficulty experienced in production of frames and lenses can be more readily visualized when it is pointed out that in addition to the Army's requirements and the great increase in commercial business in the United States, the optical companies were called upon to supply vast stockpiles of frames and lenses on lend lease; i.e., to the allied nations. Before our entrance into the war, the optical companies were working at maximum production and had no plans for expanding facilities in order to meet Army requirements should we enter the war, and consequently, upon our entrance into the war, the production of the optical industry was in rather a chaotic state.

The Army began supplying spectacles on a prescription basis for troops in this country in January 1942, and estimates were made to the contractor that for the year 1942, approximately 200,000 pairs of spectacles would be required. This was based on the estimate that 10% of all military personnel would require spectacles, and the basis of issue at that time was one pair of glasses to each individual requiring spectacles. and an additional pair supplied when such an individual was being shipped overseas. Of the numerous bids which were received, only two companies were selected for consideration inasmuch as both of these companies (American Optical Company and Bausch & Lomb Optical Company) had dispensing facilities through the medium of branch offices or affiliated branches located in the majority of large cities throughout the country. Both contractors had approximately 250 such Branch Offices, and it was felt that from the administrative and fiscal standpoints, the awarding of one contract would be a great deal easier to bandle. The contract was awarded to the American Optical Company since its price was the lowest.

After a contract was awarded to the American Optical Company, this office received a great deal of criticism from the Smaller War Plants Corporation and Congress to the effect that we were aiding and abetting a monopoly. Various small optical dispensers insisted upon our placing contracts locally in order that they might service one or two camps. The author wishes to emphasize that had we let many contracts rather than one central contract, the administrative as well as fiscal aspects would have been extremely complex, and it is strongly advocated that a central contract should always be placed.

found that approximately 2,350,000 pairs of spectacles would be issued during 1943, contracts were awarded to both the American Optical Company and the Banach & Lemb Optical Company to share proportionately the Army's individual prescription basis in July 1943, and at that time, it was realized that in order to fill this large quantity of prescriptions, it prescription work to individual dispensers located in the same city. As prescription production standpoint and requirements were met. However. delays in delivery were occasioned since a shortage of frames as well as lement was experienced, and the optical companies were not geared for this large demand. At that time, lens and frame production was apportioned between the various contractors, and the Army turned over to the contractors who supplied spectacles on a prescription basis, quantities of frames and lenses to meet the prescription demand.

When the spectacle program was being organized, it was realized that that a tremendous clerical task would be involved if it would be necessary to order spectacles on an individual prescription basis in the routine canner whereby a delivery order, a contractor's bill and receiving report would be made out for each individual pair of glasses. This would occasion a total of 24 copies, it being estimated that the clerical time involved to complete all these forms for one pair of glasses would take approximately 15 minutes, not making into consideration the contractor's time and which would require another five minutes per order. As was later indicated with

the progress of the war, the labor market became very critical, and no doubt, the method employed for individual purchases under contract would have cut a deeper groove in the labor market. All this being realized, a form (W.D., M.D. Form No. 130) was devised (copy inclosed) which acted as a combination delivery order, contractor's bill and receiving report. This form took up the size of a standard sheet, and it was finally approved by the Comptroller General for official use. Copy of the W.D., M.D. Form No. 130 is attached hereto. In the middle of 1944, a new form was devised (W.D., A.G.O. Form No. 8-145) (copy inclosed) which cut the work approximately in half inassuch as one-time carbons were furnished with the order form in sets of the required number of copies. In this manner, the task of inserting carbons was eliminated, and the following procedure for ordering spectacles was finally adopted:

- 1. The delivery order was filled showing the name of the contractor, contract number, name, age, rank and organization of the patient, name of the installation and date of the order and pertinent data concerning the prescription. (W.D., A.G.O. Form No. 8-145 was supplied in 7 copies). With the original of the delivery order signed by either a medical supply officer or the prescribing medical officer, the seventh copy was retained for a tickler file for the installation concerned, and six copies with the carbons forwarded to the nearest branch of the optical company.
- 2. After the prescription was filled, the order was returned with the spectacles and the contractors bill was filled out showing the name of the contractor and date the order was filled, the cost of the spectacles, the invoice number of the branch office and the original only signed by the Branch Manager or his designated representative. The 5th and 6th copies

were removed for the contractor's files, the remaining being forwarded to the installation with the glasses.

3. The delivery order was then completed on the four copies received from the branch office of the optical company, and notation made on the tickler copy of the date the plasses were received. The following information was contained on the delivery order: Contract number, the name of the installation, the date the spectacles were received and the original was signed by the medical supply officer. These four copies were then sent forward for processing for payment, and the seventh or tickler copy retained at the installation for its permanent record.

At the beginning of the spectacle program, all orders were forwarded to the Fiscal Division, 300, in Washington, and there the orders were audited and sent to the Finance Office for payment. However, this function was decentralized to 12 branch fiscal offices throughout the country associated with distribution depots, and eventually, consolidated to one regional fiscal office located at the St. Louis Medical Depot, St. Louis, Mo. In order that an little time as possible could be devoted to auditing spectacle order forms, various installations were directed not to concern themselves with any auditing features nor with the correctness of the price; consequently, a great burden was relieved from the installations, all of it concentrated on individuals who were auditing experts.

Further information concerning the fiscal aspects of the Optical Program is available in the history of World war II being written by the Fiscal Division, SGO.

The auditing of spectacle order forms involved a unique problem in that before the correctness of the price could be determined, the prescription had to be interpreted. With the original contracts, a price

list was made for every conceivable prescription, i.e., spheres, plus and minus in ranges of two diopters were priced separately, and the same applied to plane cylinders and compound lenses. As a result, it was necessary that prescriptions be interpreted. Unfortunately, a uniform method for writing a prescription is not the practice of the ophthalmological profession, and consequently, transposition of the prescriptions was necessary. To elaborate further, it may be stated that the following are supplied:

/ spheres; - spheres
/ cylinders
/ on / and - on / compounds, and it was

necessary to transpose any prescriptions written for minus cylinders, plus on minus and minus on minus compounds, and the following rule was established: The sign of the minus cylinder was changed to a plus and the power for the cylinder remained the same. However, this power of the minus cylinder was added algebraically to the power of the sphere. For example, a minus fifty cylinder was transposed to a minus fifty on a plus fifty. A plus fifty on a minus seventy-five was transposed to a minus twenty-five on a plus seventy-five; a minus one on a minus one was transposed to a minus two on a plus one.

On various occasions, the optical companies complained that the payments were not received for as long as six months after an order was filled, and this was primarily due to the fact that installations retained the order forms until a sufficient number was accumulated before they were forwarded to the fiscal branch office. Only through a directive that installations forward spectacle order forms in groups of 100, and in any event, once weekly if this volume was not available, was the entire problem remedied. It was also found that installations upon receiving the spectacle

order forms from the optical branch offices would accumulate such forms for weeks, and in some instances, months at a time before the Medical Supply Officer took a day off to sign all the necessary forms. Again, this was recoding by means of a directive whereby it was and mandatory that spectacle order forms would be signed the same day that the glasses were received.

At the beginning of the Optical Program, the basis of issue for spectacles, commercial type, was one pair to each individual requiring spectacles for the efficient performance of his military duties, and another pair was provided him upon emberkation for overseas. This basis of issue, of course, created a burden on the staging areas and ports of emberkation, and when large numbers of troops were being sent overseas, the optical company under contract was unable to meet the delivery schedules (3 days) with the final result that the majority of such spectacles ordered had to be sailed to the respective APO addresses, and consequently, there is no doubt that a great many individuals never received their second pair of glasses. The faultiness of this basis of issue was realized, and it was then decided that two pairs of spectacles would be issued to the individual concerned as early as possible in the training period.

Shortly after the Optical Program began, it was found that the Army ophthalmologists were ordering lenses in 1/8 diopter variations. This practice resulted in holding up delivery inasmuch as such type lenses had to be ground to prescription. Ordinarily, a wide range of foci in 1/4 diopters is carried by optical companies, thereby eliminating the necessity for grinding lenses on a prescription basis for the common type of prescriptions. However,

the ordering of 1/8 diopters as stated above, required extra work, and after consultation with many contractions both civilian and filitary, it was decided that a directive be written advising personnel doing refractions in the Army's posts, camps and stations, to not prescribe any lenses in 1/8 diopter variations.

In July 1943, a total of 190,000 pairs of spectacles were ordered, and after an analysis was made, it was found that individuals were being furnished spectacles who did not require them. As an example, there were many glasses issued with plano lenses for both eyes as well as very minor corrections such as plus or minus .25 in each eye. It was also found that some classes were issued calling for a slight prismatic correction of 1/4 to 1/2 diopter. At that time, an optical board was organized consisting of military as well as civilian ophthalmologists, and it was this Optical Advisory Board which decides that spectacles would be issued only to individuals who required a correction of more than one diopter in any meridian, in either eye. This basis of issue was in effect for perhaps two months when the Army Air Forces requested a waiver in their particular instance inasmuch as a large number of their personnel did not come under the provisions of this basis of issue although the minor corrections they required were considered essential for the afficient performance of their military duties. This was especially true in the case of individuals who required minus corrections up to one dispter and who did not come within the provisions of the basis of issue. The waiver was granted to the Army Air Forces, and shortly thereafter, it was decided that this basis of issue was also faulty. Again, the Optical Advisory Board decided that the basis of issue should be changed to individuals having a visual acuity of worse than 20/100 in either

eye or to other individuals who, in the opinion of the prescribing medical officer, required spectables for the efficient performance of military duties regardless of their visual acuity. In this latter instance, however, it was necessary that a certificate of necessity would be attached to the spectacle order form which would be certified by the prescribing medical officer and the circumstances set forth which necessitated the issuance of spectacles. The reason that the visual acuity was set as a yardstick of measurement rather than the diopter was that it was felt that the diopter rule forced refraction whereby an individual had to be refracted to determine whether he required a lens above one diopter in any meridian. On the other hand, the visual acuity rule necessitated an individual reading the 20/100 line with either eye. After a survey was made, it was found that in 60% of the instances, certificates of necessity were required, and it was realized that from the administrative standpoint, an undue burden was being placed on the already overworked eye clinics, and consequently, a basis of issue was adopted which has been in effect up to the present time whoreby spectacles would be issued to individuals requiring a correction of more than one diopter in the meridian of greatest defect in either eye or to other individuals who required spectacles for the efficient performance of military duty in the opinion of the prescribing medical officer in which instance a certificate of necessity had to accompany the order.

Concerning the certificate of necessity, in the early stages of the optical program, it was necessary that separate copies of two certificate of necessity accompany the order; however, with the adoption of W.D.,

A.G.O. Form No. 8-145 as a spectacle order form, the certificate of

necessity was printed in the purchase order section of the order form which only needed the signature of the prescribing officer, thereby eliminating the clerical problems which were involved.

At the conclusion of the war, a directive was immediately written to the effect that the basis of issue would be only one pair of spectacles to each individual requiring correction. This order was put into effect since it was felt that it would be more economical by reducing the number of pairs issued to an individual. In the event an individual would break his one pair of spectacles, he would be obliged to wait until they were either repaired or replaced. It is the opinion of the author that this directive represented false economy inasmuch as individuals who were obliged to wait for their spectacles after they were broken would be placed on sick call, and in effect, waste their time until the repaired spectacles were returned to them. It is a firm conviction that the basis of issue should be one pair to individuals with the exception of two pairs being given to those who have a visual acuity in either eye or 20/70 or worse, or a binocular visual acuity of worse than 20/40.

Although the question of hardening lenses came up quite often during the Army's Optical Program, it was never adopted. However, again, it is the opinion of the author that serious consideration should be given to the utilization of tempered or hardened lenses since the factor of breakage is less prevalent in such types of lanses. In addition, at the present time, a great deal of experimentation is being performed by various optical companies of a non-glare lens. It is obvious that such a type lens has very definite military characteristics, and if this program is successful, it is believed that the tempered, non-glare lens is ideal.

Requirements: -- Probably the greatest error of the Optical Program was the computing of requirements in the early stages of the program. Primarily. it was estimated that only 10% of all military personnel would require spectacles, and this estimate was based on the requirements of World War I as well as the Civilian Conservation Corps. Actually, it was found that somewhere between 18% and 20% of military personnel require spectacles for the efficient performance of military duties; however, if spectacles were issued without any restrictions whatsoever, there is no doubt that this percentage would probably be much higher. At the beginning of the Optical Program, inductions were at a rather moderate rate and were stepped up For the year 1943, an estimate was made that approximately 250,000 pairs of spectacles would be issued. Actually, however, approximately 2,250,000 spectacles were issued, and taking into consideration the fact that approximately five months are required for a contractor to build up his production (this involves the allocation of materials, the processing and the shipment to the branch offices), it was not unusual that delivery of spectacles was delayed as much as three to four months after an order was placed as compared to the contract delivery time called for of three days,

At the present time, requirements are figured on the basis of inductions, two pairs for each man plus a 30% per annum replacement factor covering all individuals requiring spectacles who are stationed in this country. For example, supposing one million men will be inducted in one year, 18% of which will require spectacles, and since two pairs of spectacles will be issued to each individual, a total of 360,000 pairs of

spectacles are required. Supposing further that three million men are stationed in this country, 18% of whom are wearing spectacles and each man having two pairs in his possession, with a replacement factor of 30% on the 540,000 spectacles existing would make a replacement factor of 162,000; therefore, the requirements for that year for issuance locally would be 522,000 pairs of spectacles.

Fitting and Repair Cases:—At the beginning of the optical program, it was realized that with the distribution of spectacles, it would be necessary to set up an organization which could prescribe as well as fit the frames after they were received from the optical company. Realizing that with the induction of men into the Army many opticians would find their way into the eye clinics (this being especially true when the program for providing spectacles was aunounced to the various posts, camps and stations), a fitting case, Item 3627500, Case, Spectacle, Fitting and Repair, was devised which contained frames of all sizes which would be supplied under the optical program as well as an adequate quantity of temples of various sizes as well as adjusting pliers, screwdrivers, taps and screws for the endpiece as well as temple-piece. The sizes of frames supplied were:

40	x	18	42	х	20	44	x	20	46	x	22
40	x	20	42	$\mathbf{x}$	22	44	x	22	46.	$\mathbf{x}$	24
40	x	22	42	x	24	44	x	24	46	x	26
40	x	24	42	x	26	44	x	26			
40 :	x	26									

The temple lengths supplied were 50, 6, 6, 6, and 7. The procedure set up for taking measurements of the frames as well as fitting was as follows: After refraction, the individual would present himself to the optician who would determine the size frame and temple required, and this data together with the prescription would be set forth on the spectacle order form. Upon receipt of the spectacles, the individual concerned would be

notified, and he would present himself at the installation concerned where the spectacles would be fitted to the face of the individual. This, in effect, was the procedure which was set up. However, there is no doubt that possibly as little as 20% to 25% of all installations actually followed this procedure. With the rapid rate of inductions in the early stages of the war, the eye clinics were tremendously overburdened, and with the second pair of spectacles being issued at staging areas and ports of embarkation, the majority of eye clinics dispensed entirely with fitting of spectacles to the individual's face. It was observed at many of the busy installations that the spectacles received at the eye clinic would be sent to the commanding officer of the individual's unit, and the supply sergeant would hand the spectacles to the individual. Of course, a great many individuals were glasses previously and realized that fitting was necessary, and they either fitted the glasses themselves, or when on furlough, had them adjusted at some civilian optical shop. Although it the matter since it was realized that the eye clinics were tremendously overburdened, and it would be a physical impossibility to expect them to carry the responsibility of fitting spectacles. bviously, the only solution to the problem was the addition of manpower, and this was entirely

The problem of fitting spectacles is much more important than many people realize inasmuch as individuals with high corrections require that the spectacles be properly fitted. This is especially true with individuals who have high astigmatism or who wear prisms. It is recommended that a training program be instituted whereby reducal Corps personnel could learn the art of fitting spectacles. As stated before, this phase is considered

extremely important, and the above suggestion should be considered very carefully.

Although the problem of production of spectacles has been mentioned before, it is felt extremely important to devote some space to it. As manufacturing of frames; three months are devoted to securing the raw materials which are allocated by the War Production Board; one month is required to make the necessary parts and assembly at the factory; and another month is required for shipment from the contractor's plant to the various branches throughout the country. In addition, it is necessary to have three months' requirements in production at all times since the branch office of the optical company should have two months of stock on hand and branch office. In the event requirements are under-estimated, it would take five months before pressure of demand would be somewhat minimized. For that was the fact that we had a critical shortage of manpower. Hetween the American Optical Company and the Bausch & Lomb Optical Company, about 50% of all the civilian requirements were being filled, and when these two companies were called upon to furnish prescription work (before other manufacturers were called into the picture to supply frames and lenses) a great deal of their production was devoted to Army, and other optical commanies were given an

advantage to sell more spectacles to civilians at a higher margin of profit. To meet the demands of the Army, the American Optical Company expanded its lens factory.

Distribution Problems:—Spectacles were distributed as proviously mentioned by the branch offices of the optical companies directly to the posts, camps and stations. Since obviously, optical branches were not located in the same cities as Army installations, spectacles were delivered at through the rail or by Rallway Express. However, those installations in close proximity to the branches usually made a practice of delivering in person prescriptions and at the same time picking up the finished spectacles.

The above applied to the American Optical Company. The Bausch & Lomb Optical Company, on the other hand, set up 12 shops which did nothing but military work, and these shops were located strategically throughout the country, taking into consideration the troop as well as camp displacement.

The total capacity of these branches surpassed by 10% the quantity contracted for to allow for any anticipated expansion. Of course, spectacles were delivered almost exclusively by the mail or Railway Express.

American Optical Company, on the other hand, with its network of branches, all of which were not able to handle the same capacity ranging from as low as 30 jobs a day to as high as 300 jobs a day, felt it necessary to establish farm-out points; for example, if prescriptions received at a certain branch were in excess of the allocated capacity of the particular branch, the purplus was in the early stages of the program farmed-out to the sone headquarters who, in turn, farmed-out the work to a branch office which did not have too much to do. The contract delivery time called for three days, and obviously, by employing this method, at

least 10 days were spent in the processing of mailing prescriptions and spectacles back and forth. At the insistence of the Army, a procedure be immediately farmed-out to the nearest branch office directly from the originating branch, and the spectacles in turn would be delivered directly from the farm-out branch to the installations. Another reason for poor delivery service was that Army installations kept prescriptions on hand for a total of 7 to 10 days and them submitted this large group of prescriptions to the optical branch. Ordinarily, this represented several times the capacity of the branch office, and it was impossible for the branch office to allocate its work in such a manner as to give us three day delivery service. Although directives were written on the subject (See Par. 15, War pept. Pamphlet No. 8-5, 20 June 1944). Army installations continued the practice of sending in prescriptions periodically, and up to the present time, it has been found that official letters, telephone calls and personal. contacts did not remedy the matter.

To summarize the distribution of spectacles, it is our opinion that speedier delivery would be received if the American Optical Company adopted a system of setting up strictly military shops; in that way, the total capacity of such military shops would equal the amount of the contract, and the farming—out of prescriptions would be unnecessary. As it stands at this time, with the majority of American Optical Company branches allocating a certain portion of their shop capacity to army work, there is no doubt that although we have emphasized that the Army work takes No. I priority, the branch managers realize that after the war, they will cope with civilian business exclusively, and for that reason, there is a natural

The Bausch & Lomb Optical Company, on the other hand, as stated above, has devoted a limited number of branches exclusively to Army work, and from all standpoints, delivery as well as administration of the program from the contractor's standpoint, has been simplified a great deal. In this connection, it has been the practice of the Bausch & Lomb Optical Company to held periodic meetings with all their Army branch managers, and all problems are threshed out. The Army also has a very definite advantage when such meetings are held inasmuch as pep talks are given which undoubtedly help a great deal in getting rapid delivery of spectacles.

Another advantage of establishing branches to do strictly Army work is that the number of such branches would be at a minimum, and the inventory of lenses and frames required would be much lower. In this connection, it may be stated that when contracts were let, a definite quantity of so many spectacles to be delivered per year was indicated plus an additional number of frames was to be purchased by the Government at the expiration of the contract (and in the event it was not renewed) which was necessary to be carried as an inventory.

Expeditious delivery of spectacles cannot be over-emphasized for several reasons. Primarily, spectacles are issued as early as possible in the training phase of the inductee, and it is necessary that he be equipped with the proper spectacles in order that his military duties may be efficiently performed. Expeditions delivery service again is extramely important as in the case of replacement when individuals are transferred to other installations or to staging areas and ports of embarkation for overseas movement. Unless spectacles are delivered in a certain limited

period of time, i.e., before the individuals are shipped out, the chances are that the glasses will never reach the individuals concerned. Again, expeditious delivery of spectacles is important from the morale aspect since overburdened eye clinics work long hours to prescribe glasses and them in effect have to wait long periods for the receipt of such spectacles.

As a result of poor delivery service, we have been faced with the problem of undelivered spectacles since individuals unipped overseas could not be traced. Such undelivered spectacles are returned to a central stockpile which will later be explained, and the salvage value has been very small in that only the fronts and temples can again be utilized. Only can this be accomplished after the glasses are dis-assembled. The lenses, of course, which constitute 2/3 of the cost of glasses have to be scrapped since lenses are issued on individual prescription, it being very unlikely that a certain prescription with a particular axis and of a particular size could be utilized without setting up an elaborate salvage system. At this point, however, it may be well to mention that personnel who did not have the two pairs of spectacles in their possession were not held from overseas movement.

In the early stages of the program, it was found that individuals would unduly destroy their spectacles in order to be withheld from shipment. However, with elaborate optical facilities set up in theaters of operations, it was felt that the replacement of spectacles could be accomplished in an overseas theater. Balingerers have also made the practice of breaking their spectacles or losing them so that they can go through the formality of eye examinations where the prescription was not available, and then not perform any duties for the period of time it took to deliver the spectacles. To combat this, it was ruled that military personnel, who through willful negligence or design, with the intent to temporarily incapacitate or unfit themselves for military duty

or to delay shipment overseas destroyed, lost, discarded or disposed of spectacles which had been issued to them, were guilty of a violation of Articles of War 96.

Gas Mask Spectacles:—In the early stages of the Optical Program, it was realized that a visual correction for wear beneath the gas mask had to be furnished. The British, in supplying spectacles, combined one which was practical for ordinary wear as well as for wear beneath the gas mask. This was an ordinary round eye frame with the endpiece more or less flush against the eye wire and with flat temples. Of course, since the British gas mask was unlike that issued to our military personnel, their problems were such simpler. The Germans and Japanese, on the other hand, provided a spectacle for wear beneath the gas mask which was of the goggle variety and was held to the face by an elastic band going around the head.

In issuing the visual correction beneath the gas mask, both types—
the British and German—were taken into consideration, and the German type
was ruled out since the elastic band forced the bridge of the goggle frame
too severely against the nose causing great disconfort, and when supplied
with our gas mask, caused loakage at the temple. The British type spectacle
was finally adopted although the final models were not sufficiently tested.
After some 100,000 of these frames with flat temples had been issued, tests
were made, and it was found that leakages occurred in the temples, and a
directive was immediately circulated advising of the conditions and
prohibiting the use of this spectacle beneath the gas mask. In turn, these
spectacles were used as an auxiliary pair of glasses for ordinary wear.
The basis of issue of the spectacles with the flat temples hereinafter
referred to as spectacles, gas mask type, was to each individual requiring

visual correction, and consequently, the requirements were rather high.

Later on, after exhaustive tests, it was felt that only those individuals having a binocular visual active of 20/70 or worse would receive them, and up to the present time, this has worked out very satisfactorily.

The spectacles, gas mask type, were not issued until individuals were under movement orders, and consequently, the period of time when individuals were stationed at staging areas and ports of embarkation was very limited, and it was necessary that many glasses had to be railed to oversoms stations. In changing to the 20/70 binocular visual basis of issue, it was also decided that spectacles would be issued as soon as a unit was placed in the readliness stage, and this allowed a period of four to twelve weeks to prescribe and issue spectacles which has proven to be quite ample.

A great deal of difficulty was encountered in the fitting of spectacles, gas mask type, since the temple was flush against the eye wire, and provision was only made for a maximum pupillary distance of 66 mm., the largest size being a 40 eye with a 26 bridge. This, in effect, necessitated the angling cutward of the temple pieces so that individuals with broad faces could be properly fitted, and so the temple would not dig into the skin at the temples. Since the temple pieces were flat, they were susceptible to going out of adjustment easily, and after such spectacles were put on the face several times, the temples came out of adjustment. As in the case of commercial type spectacles, fitting cases (Item 36277, Case, Spectacle, Fitting and Repair, Gas Mask Type) were distributed to all installations. Unlike the commercial type spectacles, it was necessary to fit these glasses with the utmost of care. At best, the fitting of the spectacles, gas mask type, was not good.

of gas at the temple piece, exhaustive tests were made, and it was determined that the spectacles, gas mask type, were entirely unsuitable for wear beneath the gas mask because of discomfort and gas leakage.

When this was determined, a correction for wear beneath the gas mask was designed which consisted of a 40 mm. eye wire supported by three brackets to a frame which was inserted beneath the gas mask next to the lens. Although no complaints of this type of correction have as yet been voiced, it is the opinion of this office that this is not the ideal and practical type of item to be supplied. Rather than striving to design a spectacle for wear beneath the gas mask, it would seem best if the gas mask were designed which could accommodate an ordinary pair of spectacles.

This spectacle hereinafter referred to as the Eyeglass, Gas Mask, M-1, was supplied in seven positions, five of which were with a 40 mm. eye wire, and two of which had a 36 mm. eye wire. The various positions were to take care of the various pupillary distances and also the vertical positioning of the lens to the eye. The fitting problems, of course, were complex in that the individual had to present himself with a gas mask, and the position he required had to be determined. This was, however, simplified when a plastic guide with the various positions marked was used. (See copy of fitting instructions attached.) The two positions with the 36 mm. eye wire were used for individuals with sunken eyes since the 40 mm. eye wire would press against the nose and eyebrow of such individuals. As in the case of other spectacles, it was necessary to devise a fitting case (Itom 9354000, Case, Fitting, Eyeglass, Gas Lank, M-1) which was comprised

of the various positions required, and these were automatically distributed to all installations. The basis of issue of this spectacle was the same as that of the spectacles, gas mask type, in that individuals alerted for overseas movement and who had a binocular visual acuity of 20/70 or worse, were supplied with such eyeglasses. Provision was also made to supply these spectacles to personnel who supervised training phases, etc.

Taking this basis of issue into consideration, the requirements were rather moderate in that it was felt that approximately 7% of all military personnel require such spectacles, and a maintenance factor of 30% was allowed.

In the early phases of the optical program, The Surgeon General's Office and the Chemical Warfare Survice did not mutually face the problem which was involved. Although The Surgeon General had the responsibility of supplying corrections to military personnel, the responsibility of the 'h mical Tarfare Service supplying a multable mask to take such correction cannot be minimized. This, of course, was a contributing factor for the failure of the spectacles, gas mask type. From that time on, however, there was the greatest coordination between the two services.

With large numbers of troops overseas, there was a difficult problem of distributing the Eyeglass, Cas Wask, M-1, to military personnel. Theaters were quoried on the subject, and requirements were submitted to this office, and in turn, stocks of fitting cases, frame inserts as well as pre-edged 40 mm. lenses of all conceivable feet were shipped to such theaters, and only after a painstaking effort was the Eyeglass, Gas Mask, M-1, supplied. This was a huge problem, and it is stressed that in future instances, every effort should be made to supply the correction for wear beneath the

gas mask as early as possible after troops are alerted in this country.

(Ed. Note—For the future, it would be best to either adopt a spectacle which could be used for ordinary wear as well as wear beneath the gas mask, or no fewage a mask which would accomposate a conventional conventional desired spectacle.)

Overseas Program: - When this country entered the war, it was realized that troops would be sent overseas, and consequently, provisions would Consequently, Mobile Optical Repair Unit, Item No. 93638, was devised which consisted of a 2 ton truck with a stake body. The equipment carried was edging equipment and other miscellaneous optical machinery realized that it would be accessary to design a unit which was self-contained Item No. 9958900, Truck, 25 Ton, 6x6, Optical Repair (copy of specifications inclosed), was designed which consisted of a truck with a custom built body. The equipment for all practical purposes was identical to the old unit, with the exception that surfacing equipment was added because it was found that a large stock of lenses supplied with the unit could fill only 90% to 95% of all prescriptions. This newly designed unit was heated, had water, light and could be operated under any and all weather conditions. In designing this unit, it was decided that all equipment, i.e., the surfacing and udging equipment, would be permanently mounted on the banches which were in turn permanently mounted on the floor of the body; later it

was found that it would be more ideal to make the equipment removable since occasionally, these units would operate behind the rear lines, and the ideal conditions would be to remove the equipment and operate in some building. However, for all practical purposes, this unit worked out splendidly.

In addition to the mobile unit, a unit was also designed which carried the same equipment as the mobile unit with the exception of the truck. This item was called the Base Shop Optical Repair Unit, and was assued to such service troops which were housed and which would be stationary.

In addition to these two units, a third type unit was devised, Item No. 9363900, Optical Repair Unit, Portable (copy of specifications inclosed), which consisted of two Medical Department chests containing a moderate assortment of lenses and frames, a hand operated edging machine, cutter and miscellaneous optical tools. Later, it was found that this unit did not carry a sufficiently wide range of foci, and also, that the hand operation of the edging equipment was cumbersome. As a result, a third chest was recommended for standardization which included lenses which had previously been critted as well as a number of fronts and temples and a rotor which was to be used with the edging equipment. Since the car terminated, this third chest was never purchased and put into practical operation.

To summarize, it may be stated that the equipment used and the units devised were completely adequate to do the job for which they had been developed.

Originally, one optical repair unit, mobile, and two portable optical repair units were issued to each medical supply depot. However, it was soon learned that this was an extravagent waste of optical repair facilities

and the basis of issue was set forth in T/O & E 8-500, 23 April 1944, much provided that the mobils unit (Type FF) could supply 150,000 troops and could be augmented by the portable unit (Type BG) whenever troops were scattered over a wide area. Since then, it has been found that the ideal basis of issue would be one mobile unit and two portable units for each 200,000 troops scattered over a wide area. Should, however, the 200,000 troops he all concentrated, a obile unit could easily handle the requirements.

The mobile unit and two portable units were under the control of one officer and ten enlisted men. Six enlisted men and one officer were assigned to the mobile unit and two enlisted men to each of the portable units. All of the enlisted and officer personnel were opticians. It was found that one portable unit could do between fifteen and twenty prescription jobs a day, and the mobile unit could do as much as 100 jobs per day. All this is based on an eight hour day.

In order that the Army would have a sufficient number of personnel to run the optical repair units, a training school was established at the St. Louis Medical Depot, St. Louis, Mo., where officer and enlisted personnel were given an orientation course and were made familiar with Army equipment. As can be readily visualized, it was necessary to take men into this school who had been opticians in civilian life since it was realized that it would be impossible to train other types of personnel without any optical experience in this relatively short period of time. The training course was of six weeks duration, and for all practical purposes, it was very successful. The officer personnel, on the other hand, were chosen who had had experience in managing civilian optical shops. Since these were older men and were more or less scarce in the

Army, we eventually resorted to training optometrists to take charge of the optical repair units.

Mobile units and portable units were sent to active combat theaters.

In all theaters, the consulting ophthalmologists to the theater surgeons had the responsibility for coordinating all activities of the optical repair units. This consulting ophthalmologist, in turn, often placed the responsibility with one of the optical officers under their jurisdiction.

By that means, the optical program was well coordinated, and plans could be well formulated. The base type units were sent to theaters which were not actively engaged in combat such as Iceland, Trinicad, Alaska and Hawaii.

Also, some of the active combat theaters established central laboratories, and base shops were issued for such areas. Base shops were located in England; after the invasion, in Parls; after the invasion of the Philippines, in Manila and in Australia.

In order that the optical repair units could be supplied with adequate stocks of frames, lenses and other optical equipment and tools, it was necessary to establish a stockpile at the Binghamton Medical Depot. This stockpile contained wast quantities of lenses, fronts, temples, screws, nosepads and all optical equipment and tools which had a high mortality rate. In addition, several surfacing machines, edgers, lensometers, lens cutters, etc., were kept in stock in order to replace those which might be broken or damaged beyond repair. Spare parts of equipment which had a high mortality rate were cept on hand. The European Theater was the first which established a stockpile of the own, and since about 20 units were operating in that Theater, the central stockpile serviced all these units, and it requisitioned on the Binghamton ledical Depot stockpile in order to maintain their inventories.

The system of requisitioning by each mobile unit was somewhat as follows. The unit, when it was finally situated, would requisition after the first month of operation on an actual utilization basis multiplied by the number of months required for the requisition to be sent to the central stockpile and supplies to be received. By this method, the optical repair units always had their original operating stock on hand.

The Binghamton Medical Depot, as stated before, had this central ophthalmic stockpile. Any requisitions which were placed on the Binghamton Medical Depot were sent to the Optical Section of The Surgeon General's Office in Washington for editing for two purposes. One was to gather experience as to the type of equipment being utilized and the foci most frequently used, and second, to maintain a control on the type of items requisitioned. The second purpose was as a result of the optical officers in the field requisitioning equipment for repairing all types of spectacles and sunglasses. It may be stated that the reason the optical repair units did such a remarkable job was because they were confronted only with the task of repairing and replacing a standard type of spectacle. However, in the early stages of the overseas program, officers were inclined to repair all types of spectacles, and consequently, requisition for such repair work. However, as soon as it was learned that this practice was becoming quite common, a directive was issued prohibiting the repair of spectacles to other than the type issued by the Army.

At one time, the idea of repairing sunglasses issued by the Air Forces was considered. However, after consulting with the Army Air Forces, it was mutually decided to abandon this proposed project. Therefore, the task presented the optical repair units was relatively simple.

The mobile optical repair units ordinarily operated behind the rear lines, and only in a few exceptional cases were in the forward areas or went forward with the initial invasion forces. Of the approximately fifty mobile units in overseas theaters, only one was destroyed by German aircraft which raided our rear lines.

As stated previously, the optical repair units in overseas theaters did a splendid job of the task assigned them, and this can be attributed directly to three reasons: one, the sole task was to repair and replace a standard type of spectacle issued by the Army; two, the units were commanded by personnel who in civilian life, managed optical shops; three, one individual in each theater was assigned the responsibility for coordinating all activities of the optical repair units in that theater.

There is perhaps only one serious problem which resulted in the overseas theaters, and this can be attributed to the lack of cooperation received by the individuals responsible for planning campaigns. In the African invasion, although four mobile units were sent forward, no provision was made for making available to these four units a stockpile on which they could draw until such time as requisitions could be sent to this country. Consequently, after the first few months of operation, these units were short of certain foci and other types of expendable optical equipment. However, ingenuity of the optical repair officers was remarkable in that when a definite shortage of rough emery was found, the optical officers used desert sand to accomplish the job. At any rate, after a short period of time, the entire matter was adjusted when stocks were received from this country. The lack of cooperation on the part of planning personnel is probably a direct result of the tendency to minimize or completely disregard the importance of the optical program. In most

instances, our own medical officers were entirely unsympathetic with the optical program and did not actually realize the importance of it. As the war went on and men were pulled out of the lines because of breakage of spectacles, the importance became self-evident, and future invasion campaigns were planned to include optical repair facilities as well as small stocks of optical supplies.

Conclusion: -- It may be stated that despite the unpreparedness of the Medical Department for an optical program as well as the shortsightedness during the initial phases of this program, the Medical Department can be well proud of the final result. An outstanding job was made of the extremely difficult task, and on many occasions, general officers of the Army Ground Forces and Army Air Forces have commented upon the extremely well-done job which was accomplished in overseas theaters. However, it must be borne in mind that should we ever be faced with another war, we should be prepared for all eventualities. The Medical Department should, in cooperation with commercial optical companies, keep abreast of the progress made in the optical field in order that only the best types of equipment can be utilized. It may be that some day contact lenses will supersede the type of spectacles we have today, and the Medical Department should be the first to go forth to explore this possibility. A training program should be instituted to maintain the nucleus of regular Army personnel who are opticians and officer personnel who will be well versed with problems of the Army in optical repair during wartime. Constant cooperation is important between the Navy and the War Department in order that a standard type of spectacle may be adopted. Close liaison should be maintained with the Chemical Warfare Service in order to overcome the

problem of supplying visual correction beneath the gas mask. In summary, the Medical Department should realize the problem of optical repair and constantly maintain some program in order that it might be fully prepared with the best type of personnel, equipment and supplies in the event we are again faced with another war.

STANLEY W. RYBAK

Optical & Artificial Eyes Section